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The Relationship Between Aerobic Activity, Health Conditions, and Medical Visits Among Men and Women Serving Aboard Navy Ships

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ABSTRACT

Purpose

No recent studies on Navy personnel have examined the relationship between aerobic activity and adverse health conditions or medical care visits. This study examined these relationships to determine if aerobic activity was inversely related to self-reported health conditions and medical visits.

Methods

Contingency tables were computed for amount of self-reported aerobic activity and prevalence rate of adverse health conditions, number of adverse health conditions, number of medical visits, and gender. Chi-square and Fisher's exact tests were performed. Age, educational level, marital status, and gender were controlled for in some tests.

Results

Women exercised more frequently than men, and men engaged in more work-related aerobic activity days. Women also reported more health conditions, ($P < .001$), and more medical visits, ($P < .001$). Exercise was not related to number of reported health conditions overall, ($P = 0.12$), but frequent exercisers had a lower prevalence rate of specific adverse health conditions than infrequent exercisers. Those with frequent work-related aerobic activity had more overall health conditions than more sedentary workers, $P < .001$, and reported more specific adverse conditions. In contrast to the favorable association of exercise with reported health conditions, women who reported exercising frequently had more medical visits.

Conclusions

Moderate exercise is beneficial, but frequent work-related aerobic activity might have adverse health effects. According to self-reports, Navy men and women exercise more than their civilian counterparts, but some are still not meeting the minimum amounts recommended by the Navy. As shipboard living conditions differ greatly from most other living environments, caution should be used in the generalization of these results.

Key words: US Navy, epidemiology, shipboard populations, aerobic activity, health conditions, prevalence, medical visits, gender differences, physical activity, exercise, occupational health

INTRODUCTION

Some measures suggest that the health of the United States population is improving. According to the National Center for Health Statistics, deaths by cardiovascular and coronary heart disease declined by 31% and 37%, respectively, from 1979 to 1995.[1] But heart disease continues to be the number one cause of death in the United States.[1] A major and preventable risk factor for heart disease is lack of aerobic activity.[1] Studies have shown aerobic activity to be associated with lower rates of coronary heart disease, hypertension, non-insulin dependent diabetes mellitus, osteoporosis, colon cancer, anxiety, and depression.[2,3] Aerobic activity is also a means to achieve and maintain a healthy weight[4], muscle strength, and endurance[5]. Despite the widely accepted attributes of aerobic activity, the amount that Americans engage in has remained unchanged over the past ten years, and the proportion of people who are overweight has increased.[1] Sixty percent of the American population do not regularly engage in aerobic activity and 25% do not engage in any aerobic activity at all.[1]

The American Heart Association and the American College of Sports Medicine have made public aerobic activity recommendations.[1] A 1995 panel discussion established by the Center for Disease Control concluded, "every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week".[2] These recommendations are also relevant to the US military population. In the last two decades the Department of Defense (DOD)[6-10] has made health promotion a priority by establishing a series of health promotion directives. In line with these directives, the Office of Chief of Naval Operations instituted its Health and Physical Readiness Program in 1982.[6-10] It is the policy of this program that physical fitness, by means of aerobic activity promotion, is a crucial element of mission performance .[6] Despite this program, the prevalence of overweight among military individuals has increased, as has that of their civilian counterparts.[9] In contrast a larger proportion of military personnel are exercising than are civilians. A DoD-funded study concluded that 58.9% of Navy personnel, versus 67.7% of total US armed services members, engaged in strenuous exercise at least 3 days per week for at least 20 minutes per occasion .[9] Although military personnel were found to be more active than the general US population, many are still not engaging in the recommended amounts of aerobic activity.

In 1997 the DoD introduced Tricare as its new health care provider in a direct response to its escalating health care costs. [11] The Navy is currently responsible for providing health insurance to 382,145 active-duty personnel.[12] Approximately 49,000 are hospitalized each year .[13] Although many of these hospitalizations are due to diseases and injuries that are caused by environmental conditions (e.g., occupational exposures), many hospitalizations are related to preventable lifestyle factors.[9] In 1996, LeDuc found that more than 40% of all illnesses and premature deaths in the US were related to lifestyle.[14]

Aerobic activity has also been found to lower workers' absenteeism rates.[15-16] When using illness-related absences as a measure of adverse health conditions, Lynch and colleagues[15] found a significant decrease in sick days due to illness after employees joined a work-based exercise program for both men and women, they found the least amount of illness-related absences among those who participated in a work-based exercise program of at least 5 days a week. When the numbers of exercise days was equal, men showed fewer illness-related absences than women did. In a similar study, Baun and colleagues[16] found an association between exercise and decreased absenteeism due to illness among female exercisers. Health care costs were lower among exercisers (male $561, females $639) than among nonexercisers (male $1003, females $1535). They did not find these overall differences to be statistically significant, but when ambulatory health care cost was examined alone, it was found to be significantly higher for nonexercisers (males $486, female $883) compared with exercisers (males $408, females $243). The authors of both studies acknowledge that their findings may reveal characteristics of exercisers rather than of exercise per se, but the findings are provocative.

Much evidence shows there is a difference between the amount of aerobic activity men and women engage in.[3,19,20] One national sample found women are less likely to walk and engage in strenuous aerobic activities than men .[21] Further research found the same result for Navy women.[19] In contrast, amount of aerobic activity did not vary significantly for gender in either a Navy longitudinal study[22] or a DoD-wide survey.[9] Ross and Bird[21] found that men report better health than women, and women are less likely to engage in strenuous exercise than men. They found that men both perceived themselves as being healthier and were in fact healthier than the women they studied.

Current research on the relationship between aerobic activity, health conditions, and medical care suggests that further investigation is required. Despite the literature on the general population, no recent studies examining Navy personnel have been conducted in this area.

METHODS

Participants

All women serving aboard Navy ships in 1995 and an equal number of men were eligible for inclusion in this study.[23] The Bureau of Navy Personnel provided a listing of all ships with women assigned aboard. A total of 74 ships with 7944 women and 69,012 men assigned were determined to be eligible for inclusion in the study. Based on availability as determined by the Commanding Officer and Medical Department of each ship, 38 ships were selected, including 6072 women assigned aboard and an equal number of men matched on age, ship, work division, department, ethnicity, pay grade, and rating categories. Surveys were collected from 3793 women crewmembers and a matched comparison group of 3641 men (there were 152 women for whom matching men did not complete questionnaires). Self-reported exercise and health conditions were reported on one of four forms used in the survey (Form 123). The four forms were assigned to subjects by a random sampling procedure based on terminal digit of social security number. A total of 2257 volunteers completed Form 123 and are the basis of this study. Of these, 1914 participants answered all variables addressed in this study and were included in the analyses.

Instrument

A consent form and The US Navy Shipboard Health Survey Form 123 were used to collect the data for this study. The consent forms that were administered along with the surveys introduced and explained the study to each volunteer. All volunteers were informed that the purpose of the study was to enhance knowledge concerning the provision of medical care and health promotion. Participants were assured that all their responses would be confidential and anonymous.

Researchers at the Naval Health Research Center (NHRC) developed this survey based on (1) reviews of existing surveys, literature, and standard scales; (2) a panel of subject matter experts; (3) elicitation of major issues from knowledgeable sources; and (4) a review of Navy

requirements and regulations.[23] The questions used to measure health conditions and medical visits were developed through review of the National Ambulatory Medical Care Survey from the National Center for Health Statistics (NCHS). Questions selected from the NCHS survey were included based on relevance to the study and face validity of their content. No formal evidence of validity and reliability are available for this item subset of the National Ambulatory Medical Care Survey. The two aerobic activity questions (items 47 and 48) were developed specifically for this survey based on relevance to military concerns and face validity of their content. No formal evidence of validity and reliability are available for the aerobic activity items. In addition, one ship was identified to pilot test the survey instrument and the results were examined for clarity of questions, completeness of responses, and general effectiveness of the instrument.

Design

A static-group comparison design was used in the present study. All participants were administered surveys to determine their exercise and work-related level of aerobic activity. Based on their responses on 2 aerobic activity questions, participants were classified as having a low, moderate, or high exercise and work aerobic activity level, and each participant was coded into 1 exercise and 1 work-related aerobic activity group.

After participants were coded into activity groups, the survey was used to determine whether they had received medical care in the past 30 days, and if so, how many times. The survey also asked whether or not the respondent had experienced any adverse health conditions in the past 30 days, and if so, how many and which conditions. Comparisons were then made between aerobic activity groups on health conditions and medical care. Further, comparisons were made to determine if men and women differed on the amount of exercise and work-related aerobic activity they participated in, the prevalence rate and number of adverse health conditions they experienced, and the number of medical care visits they reported.

Procedures for Data Collection

Each study participant was individually handed a study packet including consent forms

sign consent forms, and, if they consented, to complete the survey. When it was not practical for all participants to remain in one area, due to shipboard activity, surveys were distributed, and the participants were allowed to complete them in their workspaces. Study staff then collected completed surveys in sealed envelopes.

Statistical Analyses

In order to describe and summarize the data, frequency distributions were calculated for the independent variables (self-reported amount of aerobic activity and gender) and the dependent variables (self-reported number of health conditions and medical care visits). Frequency distributions were also calculated for potentially confounding variables (marital status, educational level, and age).

To test the hypotheses, contingency tables were developed for amount of aerobic activity, number of adverse health conditions, number of medical visits, and gender. The SPSS[24] crosstabulations procedure provided percentages, frequencies, standardized residuals, chi-square and Fisher's exact tests. The standardized residuals (SR) were included to help determine which attributes were the major contributors to the significant chi-squares. If the SR is greater than 2.0 it is considered a noteworthy contributor to the significant chi-square value.[25] The analyses were performed with an alpha probability level set at 0.05. Some contingency tables were developed to allow stratification by age, educational level, marital status, and gender.

RESULTS

A total of 2257 surveys were returned with responses to some or all items. The percentage of missing data for each item varied from less than 1% (age and gender) to 4.7% (medical visit item). No individual missed more than 3 items, and most men and women missed only 1 item. Based on examination of the missing data, data were included only from individuals who responded to all items in the present analysis. Casewise deletion excluded 15% of the total 2257 participants. After removing respondents with missing data, there were 1914 usable cases, including 948 (85%) men and 966 (85%) women included in the analyses.

No significant difference was found in the proportion of men compared to women in the

age categories (see Table 1). There were differences among the educational levels and marital status groups, χ^2 (6, n = 1914) = 41.00, P < .001 and χ^2 (3, n = 1914) = 56.70, P < .001, respectively. Greater proportions of women than men had at least some college education and were never married. Greater proportions of men than women had received a GED as their highest education level and were married.

For men and women combined, 15% reported no exercise. About 65% exercised at least 3 times a week, and 22% reported exercising an average of 5 days a week.

Men and women differed in the amount of exercise and work-related aerobic activity in which they engaged χ^2 (2, n = 1914) = 14.660, P = .001. Men and women also differed in the amount of work-related aerobic activity, χ^2 (2, n = 1914) = 16.301, P < .001. A larger proportion of women than men exercised an average of 5 days or more. Men engaged in more work-related aerobic activity days than women. No relationships were found between exercise and marital status, or exercise and age, for men or women.

Prevalence rates of specific adverse health conditions were different in men than in women. Table 2 shows one-month prevalence rates of self-reported health conditions according to gender. Headache, common cold symptoms, cough, sore throat, and sinus trouble were the 5 most frequently reported health conditions, in that order, for both men and women. Nineteen percent of men and the same percentage of women reported experiencing muscle sprain or strain. An equal proportion of men and women (10%) also reported hearing problems. A greater proportion of women, (25%) than men (7%), reported nausea or vomiting. Overall, men and women differed significantly in prevalence of most health conditions.

Men and women differed significantly in the total number of health conditions they reported, χ^2 (2, n = 1914) = 102.08, P < .001. Thirty-six percent of women reported more than 7 health conditions, compared to 20% of men. Eighty-one percent of men and 91% of women reported experiencing at least one health condition in the past month. The mean number of health conditions was 4 for men and 6 for women. The most common number of health conditions reported was 4, and the maximum was 25.

There was a significant difference in the number of medical visits for men compared to women, χ^2 (2, n = 1914) = 56.583, P < .001. Sixty-five percent of men reported no medical visits in the past month compared to 49% of the women. Only 15% of men reported 2 or more visits in contrast to 27% of women. Of those who reported a medical visit (n = 824), the mean number of medical visits was 1.8 for men and 2.1 for women. The most common number of visits was one visit, and the greatest number of visits was 9.

The average number of days per week engaging in exercise was not significantly related to number of reported health conditions, χ^2 (4, n = 1914) = 7.318, P = .12. Analyses controlling for gender, educational level, age, and marital status also showed no relationship between exercise and number of health conditions reported (not shown).

A relationship was present between number of work-related aerobic activity days and number of health conditions χ^2 (4, n = 1914) = 22.274, P < .001. Most individuals who engaged an average of 5 – 7 work-related aerobic activity days a week also reported a high number of health conditions. This persisted after controlling for gender, with χ^2 (4, n = 966) = 15.32, P = .004 for women, and χ^2 (4, n = 948) = 25.95, P < .001, for men. After controlling for educational level, only high school graduates were found to show a relationship, χ^2 (4, n = 951) = 19.83, P = .001. Personnel who reported a high level of exercise-related aerobic activity had a lower prevalence rate of many specific adverse health conditions than those who engaged in a low level of exercise-related aerobic activity, including dizziness, nausea\vomiting, shortness of breath, hoarseness, back problems, and hearing problems (Table 3).

Personnel who engaged in a high level of work-related aerobic activity had a higher prevalence rate of many specific adverse health conditions than those who engaged in a low level of work-related aerobic activity. The direction of all relationships was the same. Individuals who reported engaging in 5 – 7 days a week of work-related aerobic activity were more likely to self-report common cold symptoms, dizziness, chills, cough, sore throat, fever, flu, diarrhea, stomach pains, indigestion, shortness of breath, muscle sprain or strain, back problems, pain in stomach, and other health problems (Table 4). After controlling for gender, common cold symptoms, cough, sore throat, stomach problems, sinus trouble, pain in stomach or abdomen, and headache

items showed significant differences for men but not women. On the contrary, dizziness, flu and muscle sprain or strain showed differences for women but not men.

Personnel who engaged in a high level of exercise-related aerobic activity did not report less frequent medical care visits than those who engaged in a low level of exercise-related aerobic activity. Personnel who engaged in a high level of work-related aerobic activity did not report less frequent medical care visits than those who engaged in a low level of work-related aerobic activity. No significant relationships were found between average number of days per week participating in either type of aerobic activity and number of medical visits. Chi-square tests were also calculated to determine if there were any interactions within the control variables. When controlling for gender, a significant relationship was found for women, χ^2 (4, n = 966) = 12.061, P = .017, but not for men. Most of the women who reported exercising 5 – 7 days a week (25%) reported 2 or more medical visits in the past month. No interactions were found after controlling for marital status, educational level, and age (not shown).

DISCUSSION

Gender differences were found for aerobic activity, type and number of health conditions, and number of medical visits. In contrast with other studies, women were found to exercise more frequently than men.[19,21] But more men than women had physically demanding jobs that required frequent aerobic activity. This is not surprising, given that in both military and civilian populations, men are traditionally employed in physically demanding jobs more often than women. Unlike a study conducted by Boutelle and colleagues[17], no relationships were found between marital status, age, and educational level and frequency of exercise.

Women had more health conditions and, perhaps as a result, more medical visits. Only for women were relationships found between work-related aerobic activity and number of medical visits. Women who reported the most days of work-related aerobic activities were also found to have the most medical visits.

Gender differences were found for most health conditions, with the greatest proportional difference found for nausea or vomiting, with women reporting this condition more often than

men. This may be due to biological differences between men and women, or to pregnancy, which often causes nausea. Women reported experiencing more adverse health conditions overall, but the same types of health conditions were at the top of the list of conditions for both groups, namely headache, common cold symptoms, cough, sore throat, sinus trouble, muscle sprain or strain, and hearing problems. While most of these problems are common in the civilian population, the finding that hearing problems were so commonly reported by both men and women requires further investigation.

Overall, exercise rates were similar to those reported in the Navy population by Bray and colleagues.[9] They were also similar to what has been found in other studies, and the participants in this study were found to exercise more frequently than the general population.[1] In the present study, prevalence rates of certain health conditions, not total number of conditions, were related to frequency of exercise. Sedentary sailors were more likely to report dizziness, nausea or vomiting, hearing problems, hoarseness, back problems, and shortness of breath. Interestingly, work-related aerobic activity showed a different relationship with health condition prevalence rates. It is most likely that these symptoms were the cause of being sedentary rather than an effect. Men and women who were frequently physically active on the job showed the highest prevalence rates for most of the health conditions. It would be informative for future research to examine the specific job types and the tasks they involve to help explain other possible causes of the high prevalence of these symptoms. It may not be the amount of aerobic activity one engages in, but rather the job tasks and the environments that are characteristic of certain jobs that are important. Also, the survey only questioned whether the amount of time spent engaging in the task was at least 20 minutes. As a result, it is unclear exactly how much time was actually spent on physically demanding tasks. Some individuals could spend the majority of their workday in aerobic activity, while spending more than a few hours per day in exercise during leisure time is relatively unlikely.

Only one relationship was found between aerobic activity and number of medical visits. Women who reported exercising the most also had the most medical visits. In a similar study, Lynch and colleagues also found this for women, but only when exercise amounts were equal to

those of men.[15] Manning and Fusilier found this for both men and women.[18] Some individuals may exercise to an excessive degree, possibly making injuries more likely.

A limitation to this study was that the survey used was not specifically designed to measure all of the relationships examined here. It was not possible to examine relationships with running, bicycle riding, and other specific types of activity, or the average length of time spent in the activity. Another limitation of this study was that the data were based on self-reports, and respondents may have provided inaccurate information due to imprecision of memory or other factors. Additionally, shipboard living conditions differ greatly from civilian living environments, so caution should be used in the generalization of these findings to other populations living under different conditions.

Although Navy personnel continue to show they exercise more than the civilian population, some Navy personnel are still not exercising at all or not enough to meet minimum recommended amounts. Closer examination is warranted to determine the types of aerobic activities sailors engage in on the job as well as environmental factors that could be associated with certain health conditions. Finally, further examination is warranted regarding the Navy's Physical Readiness Program to ensure that all sailors are allowed enough time during the day to participate in aerobic exercise.

REFERENCES

1. US Department of Health and Human Services. Healthy People 2000 Review, 1998-99: Public Health Service. Hyattsville, MD: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2000.

2. Pate RR, Pratt M, Blair SN et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. JAMA 1995 Feb 1;273(5):402-7. 3

3. US Department of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.

4. Biddle SJ, Fox KR. Exercise and health psychology: emerging relationships. Br J Med Psychol 1989 Sep;62 (Pt 3):205-16. Review.

5. Fentum P, Bassey EJ, Turnbull N. The new case for exercise. London: Health Education Authority/Sports Council, 1988.

6. Chief of Naval Operations. Physical Readiness Program. US Department of the Navy, 2000 May. OPNAVINST 6110.1B.

7. US Secretary of Defense. DoD Physical Fitness and Body Fat Program. US Department of Defense, 1995 July. DOD DIRECTIVE 1308.10.

8. US Secretary of Defense. Health Promotion. US Department of Defense, 1986 March.: DOD DIRECTIVE 1010.10.

9. Bray RM, Sanchez RP, Ornstein ML et al. 1998 Department of Defense Survey of Health Related Behaviors Among Military Personnel. Research Triangle Institute; 1999. Report No.: RTI/7034/006-FR.

10. Chief of Naval Operations. Health Promotion Program. US Department of the Navy; 1992 February. OPNAVINST 6100.2.

11. US Department of Defense. Tricare: your military health plan, why Tricare? Falls Church, VA: Health Affairs Tricare Marketing Office, 1996.

12. Navy Office of Information. Status of the United States Navy. Washington, DC: Navy News; May 2002.

13. Naval Health Research Center. NHRC Scientists Develop a User-Friendly Medical Information System for the PC. San Diego, CA: NHRC News; July 1997.

14. LeDuc JW. Untitled article. US Med 1996;32(15&16):4-6.

15. Lynch WD, Golaszewski TJ, Clearie AF, Snow D, Vickery DM. Impact of a facility-based corporate fitness program on the number of absences from work due to illness. J Occup Med 1990 Jan;32(1):9-12.

16. Baun WB, Bernacki EJ, Tsai SP. A preliminary investigation: effect of a corporate fitness program on absenteeism and health care cost. J Occup Med 1986 Jan;28(1):18-22

17. Boutelle KN, Murray DM, Jeffery RW, Hennrikus DJ, Lando HA. Associations between exercise and health behaviors in a community sample of working adults. Prev Med 2000 Mar;30(3):217-24.

18. Manning MR, Fusilier MR. The relationship between stress and health care use: an investigation of the buffering roles of personality, social support and exercise. J Psychosom Res 1999 Aug;47(2):159-73.

19. Hourani LL, Yuan, H., Bray, R.M., & Wheeless, S. The Health Status of Women in the Navy and Marine Corps: Preliminary Findings from the Perceptions of Wellness and Readiness (POWR) Assessment. San Diego, CA: Naval Health Research Center; 1998. Report No.: 98-19.

20. Stevens LT, Conway, TL. Exercise and Three Psychosocial Variables: A Longitudinal Study. San Diego, CA: Naval Health Research Center, 1991. Report No.: 91-31.

21. Ross CE, Bird CE. Sex stratification and health lifestyle: consequences for men's and women's perceived health. J Health Soc Behav 1994 Jun;35(2):161-78.

22. Trent LK, Hurtado SL. Longitudinal trends and gender differences in physical fitness and lifestyle factors in career US Navy personnel (1983-1994). Mil Med 1998 Jun;163(6):398-407.

23. Garland FC. Women Aboard Navy Ships a Comprehensive Health and Readiness Research Project: Year Two Report. Volume 1, Final Report. San Diego, CA. Naval Health Research Center; 1996 Dec. Report No.: OPKM6654.

24. Norusis MJ. SPSS 6.1 guide to data analysis. Englewood Cliffs, NJ: Prentice-Hall.1995.

25. Hinkle DE, Wiersma W, & Jurs, SG. Applied statistics for the behavioral sciences. 3rd ed. Boston: Houghton Mifflin Company; 1994.

Table 1. Demographic characteristics by gender, active-duty US Navy personnel in Shipboard Study, 1995-1996

	Men (n = 948)			Women (n = 966)			Total (n = 1,914)		
	No.	%	SR*	No.	%	SR	No.	%	P
Educational level									<0.001
Some High School	10	(1)	0.74	6	(1)	-0.73	16	(1)	
GED	47	(5)	2.19	22	(2)	-2.17	69	(4)	
High School Graduate	510	(54)	1.80	441	(46)	-1.78	951	(50)	
Trade\Technical	51	(5)	1.12	37	(4)	-1.11	88	(5)	
Some College\AA	249	(26)	-3.16	365	(38)	3.13	614	(32)	
BA/BS	61	(6)	-0.89	77	(8)	0.88	138	(7)	
Graduate Degree	20	(2)	0.27	18	(2)	-0.27	38	(2)	
Age in years									0.78
18-24	504	(53)	-0.08	517	(54)	0.07	1021	(53)	
25-29	184	(19)	-0.02	188	(19)	0.02	372	(19)	
30-34	145	(15)	-0.21	153	(16)	0.21	298	(16)	
35-39	75	(8)	-0.09	78	(8)	0.09	153	(8)	
40-47	40	(4)	0.91	30	(3)	-0.90	70	(4)	
Marital Status									<0.001
Never Married	407	(43)	-2.06	503	(52)	2.04	910	(48)	
Married	468	(50)	3.82	324	(34)	-3.79	792	(41)	
Separated	32	(3)	-2.01	60	(6)	1.99	92	(5)	
Divorced or Widowed	41	(4)	-2.39	79	(8)	2.37	120	(6)	

Note. Percentages were rounded up to the nearest whole number.

*SR = Standardized residuals.

Table 2. One-month prevalence rate of health conditions by gender, active-duty US Navy personnel in Shipboard Study, 1995-1996

Health condition		Men (n = 948) No.	%	SR*	Women (n = 966) No.	%	SR	Total (n = 1914) No.	%	P
Headache	No	494	(52)	5.85	273	(28)	-5.80	767	(40)	<0.001
	Yes	454	(48)	-4.79	693	(72)	4.74	1147	(60)	
Common cold symptoms	No	495	(52)	2.21	410	(42)	-2.19	905	(47)	<0.001
	Yes	453	(48)	-2.09	556	(58)	2.07	1009	(53)	
Cough	No	598	(63)	1.13	555	(57)	-1.12	1153	(60)	<0.01
	Yes	350	(37)	-1.39	411	(43)	1.37	761	(40)	
Sore throat	No	648	(68)	1.78	572	(59)	-1.76	1220	(64)	<0.001
	Yes	300	(32)	-2.36	394	(41)	2.34	694	(36)	
Sinus trouble	No	687	(72)	2.25	586	(61)	-2.23	1273	(67)	<0.001
	Yes	261	(28)	-3.17	380	(39)	3.14	641	(33)	
Back problems	No	734	(77)	1.50	668	(69)	-1.49	1402	(73)	<0.001
	Yes	214	(23)	-2.49	298	(31)	2.46	512	(27)	
Pain in stomach or abdomen	No	808	(85)	3.45	637	(66)	-3.42	1445	(75)	<0.001
	Yes	140	(15)	-6.06	329	(34)	6.00	469	(25)	
Irritated eyes	No	782	(82)	1.10	736	(76)	-1.09	1518	(79)	0.001
	Yes	166	(18)	-2.15	230	(24)	2.13	396	(21)	

Table 2 Continued - One-month prevalence rate of health conditions by gender

Health Condition		Men (n = 948)			Women (n = 966)			Total (n = 1914)		
		No.	%	SR	No.	%	SR	No.	%	P
Stomach problems	No	794	(84)	1.76	712	(74)	-1.74	1506	(79)	<0.001
	Yes	154	(16)	-3.38	254	(26)	3.35	408	(21)	
Skin problems	No	804	(85)	1.29	747	(77)	-1.28	1551	(81)	<0.001
	Yes	144	(15)	-2.67	219	(23)	2.64	363	(19)	
Indigestion	No	799	(84)	0.68	776	(80)	-0.67	1575	(82)	0.03
	Yes	149	(16)	-1.46	190	(20)	1.45	339	(18)	
Muscle sprain or strain	No	764	(81)	0.01	778	(81)	-0.01	1542	(81)	1.00
	Yes	184	(19)	-0.02	188	(19)	0.02	372	(19)	
Nausea/vomiting	No	878	(93)	3.08	720	(75)	-3.05	1598	(83)	<0.001
	Yes	70	(7)	-6.92	246	(25)	6.85	316	(17)	
Unable to perform duties because of a health condition	No	821	(87)	1.21	768	(80)	-1.20	1589	(83)	<0.001
	Yes	127	(13)	-2.68	198	(20)	2.65	325	(17)	
Fever	No	824	(87)	1.46	757	(78)	-1.45	1581	(83)	<0.001
	Yes	124	(13)	-3.19	209	(22)	3.16	333	(17)	
Dizziness	No	851	(90)	1.93	757	(78)	-1.92	1608	(84)	<0.001
	Yes	97	(10)	-4.43	209	(22)	4.39	306	(16)	
Chills	No	846	(89)	1.43	780	(81)	-1.42	1626	(85)	<0.001
	Yes	102	(11)	-3.40	186	(19)	3.37	288	(15)	
Constipation	No	886	(93)	1.87	794	(82)	-1.85	1680	(88)	<0.001
	Yes	62	(7)	-5.01	172	(18)	4.96	234	(12)	

Table 2 Continued - One-month prevalence rate of health conditions by gender

Health condition		Men (n = 948)			Women (n = 966)			Total (n = 1914)		
		No.	%	SR	No.	%	SR	No.	%	P
Shortness of breath	No	878	(93)	1.33	817	(85)	-1.32	1695	(89)	<0.001
	Yes	70	(7)	-3.69	149	(15)	3.66	219	(11)	
Diarrhea at least 3 days	No	872	(92)	0.50	859	(89)	-0.50	1731	(90)	0.02
	Yes	76	(8)	-1.54	107	(11)	1.52	183	(10)	
Hoarseness	No	873	(92)	0.74	846	(88)	-0.73	1719	(90)	0.001
	Yes	75	(8)	-2.20	120	(12)	2.18	195	(10)	
Hearing problems	No	852	(90)	0.00	868	(90)	0.00	1720	(90)	1.00
	Yes	96	(10)	-0.01	98	(10)	0.01	194	(10)	
Flu	No	864	(91)	0.23	867	(90)	-0.22	1731	(90)	0.31
	Yes	84	(9)	-0.70	99	(10)	0.69	183	(10)	
Hay fever	No	885	(93)	0.74	858	(89)	-0.73	1743	(91)	<0.001
	Yes	63	(7)	-2.36	108	(11)	2.34	171	(9)	
Trouble seeing	No	898	(95)	0.65	876	(91)	-0.65	1774	(93)	0.001
	Yes	50	(5)	-2.32	90	(9)	2.30	140	(7)	
Heat stress or heat stroke	No	925	(98)	0.16	933	(97)	-0.15	1858	(97)	0.22
	Yes	23	(2)	-0.90	33	(3)	0.89	56	(3)	

Note. Percentages were rounded up to the nearest whole number.

*SR = Standardized residuals.

Table 3. Type of health condition by average days per week of exercise-related aerobic activity, active-duty US Navy personnel in Shipboard Study, 1995-1996

Health Condition		Aerobic Exercise Frequency per Week: 0 – 1 days (n = 433) No.	%	SR*	2 – 4 days (n = 1063) No.	%	SR	5 – 7 days (n = 418) No.	%	SR	P
Common cold symptoms	No	192	(44)	-0.89	508	(48)	0.24	205	(49)	0.52	0.34
	Yes	241	(56)	0.84	555	(52)	-0.23	213	(51)	-0.50	
Dizziness	No	350	(81)	-0.72	894	(84)	0.03	364	(87)	0.68	0.05
	Yes	83	(19)	1.66	169	(16)	-0.07	54	(13)	-1.57	
Chills	No	355	(82)	-0.67	920	(87)	0.56	351	(84)	-0.22	0.07
	Yes	78	(18)	1.59	143	(13)	-1.34	67	(16)	0.52	
Cough	No	246	(57)	-0.92	637	(60)	-0.13	270	(65)	1.15	0.06
	Yes	187	(43)	1.13	426	(40)	0.16	148	(35)	-1.41	
Sore throat	No	268	(62)	-0.48	686	(65)	0.32	266	(64)	-0.03	0.63
	Yes	165	(38)	0.64	377	(35)	-0.43	152	(36)	0.04	
Fever	No	364	(84)	0.33	880	(83)	0.07	337	(81)	-0.45	0.41
	Yes	69	(16)	-0.73	183	(17)	-0.14	81	(19)	0.97	
Flu	No	387	(89)	-0.23	973	(92)	0.38	371	(89)	-0.36	0.18
	Yes	46	(11)	0.71	90	(8)	-1.15	47	(11)	1.11	
Diarrhea at least 3 days	No	385	(89)	-0.33	968	(91)	0.21	378	(90)	0.00	0.44
	Yes	48	(11)	1.03	95	(9)	-0.66	40	(10)	0.01	
Stomach problems	No	329	(76)	-0.63	842	(79)	0.19	335	(80)	0.34	0.27
	Yes	104	(24)	1.22	221	(21)	-0.37	83	(20)	-0.65	

Table 3 Continued - Health condition by exercise

Health Condition		Aerobic Exercise Frequency per Week: 0 – 1 days (n = 433) No.	%	SR	2 – 4 days (n = 1063) No.	%	SR	5 – 7 days (n = 418) No.	%	SR	P
Constipation	No	367	(85)	-0.67	940	(88)	0.23	373	(89)	0.32	0.08
	Yes	66	(15)	1.80	123	(12)	-0.61	45	(11)	-0.85	
Indigestion	No	357	(82)	0.04	865	(81)	-0.33	353	(84)	0.49	0.38
	Yes	76	(18)	-0.08	198	(19)	0.71	65	(16)	-1.05	
Nausea/vomiting	No	338	(78)	-1.24	903	(85)	0.52	357	(85)	0.43	0.002
	Yes	95	(22)	2.78	160	(15)	-1.17	61	(15)	-0.96	
Sinus trouble	No	280	(65)	-0.47	704	(66)	-0.11	289	(69)	0.66	0.37
	Yes	153	(35)	0.66	359	(34)	0.16	129	(31)	-0.93	
Hay fever	No	390	(90)	-0.22	969	(91)	0.03	384	(92)	0.17	0.65
	Yes	43	(10)	0.69	94	(9)	-0.10	34	(8)	-0.55	
Shortness of breath	No	368	(85)	-0.79	955	(90)	0.44	372	(89)	0.09	0.03
	Yes	65	(15)	2.20	108	(10)	-1.24	46	(11)	-0.26	
Hoarseness	No	375	(87)	-0.70	968	(91)	0.43	376	(90)	0.03	0.04
	Yes	58	(13)	2.09	95	(9)	-1.28	42	(10)	-0.09	
Skin problems	No	348	(80)	-0.15	864	(81)	0.09	339	(81)	0.01	0.92
	Yes	85	(20)	0.32	199	(19)	-0.18	79	(19)	-0.03	
Muscle sprain or strain	No	348	(80)	-0.05	851	(80)	-0.18	343	(82)	0.34	0.68
	Yes	85	(20)	0.09	212	(20)	0.38	75	(18)	-0.69	
Back problems	No	289	(67)	-1.58	794	(75)	0.55	319	(76)	0.73	0.002
	Yes	144	(33)	2.62	269	(25)	-0.91	99	(24)	-1.21	

Table 3 Continued - Health condition by exercise

		Aerobic Exercise Frequency per Week								
		0 – 1 days (n = 433)			2 – 4 days (n = 1063)			5 – 7 days (n = 418)		
Health Condition		No.	%	SR	No.	%	SR	No.	%	SR	P
Hearing problems	No	376	(87)	-0.66	956	(90)	0.02	388	(93)	0.64	0.02
	Yes	57	(13)	1.98	107	(10)	-0.07	30	(7)	-1.90	
Irritated eyes	No	333	(77)	-0.56	853	(80)	0.34	332	(79)	0.03	0.35
	Yes	100	(23)	1.10	210	(20)	-0.67	86	(21)	-0.05	
Trouble seeing	No	398	(92)	-0.17	989	(93)	0.12	387	(93)	-0.02	0.75
	Yes	35	(8)	0.59	74	(7)	-0.43	31	(7)	0.08	
Pain in stomach or abdomen	No	318	(73)	-0.49	809	(76)	0.23	318	(76)	0.14	0.53
	Yes	115	(27)	0.86	254	(24)	-0.40	100	(24)	-0.24	
Heat stress or heat stroke	No	413	(95)	-0.36	1038	(98)	0.19	407	(97)	0.06	0.66
	Yes	20	(5)	2.06	25	(2)	-1.09	11	(3)	-0.35	
Headache	No	169	(39)	-0.34	422	(40)	-0.19	176	(42)	0.66	0.61
	Yes	264	(61)	0.28	641	(60)	0.16	242	(58)	-0.54	
Unable to perform duties because of a health condition	No	352	(81)	-0.39	887	(83)	0.15	350	(84)	0.16	0.55
	Yes	81	(19)	0.87	176	(17)	-0.33	68	(16)	-0.35	

Note. Percentages are rounded up to the nearest whole number.

*SR = Standardized residuals.

Table 4. Type of health condition by average days per week of work-related aerobic activity, active-duty US Navy personnel in Shipboard Study, 1995-1996

		No. of days per week of work-related aerobic activity							
		0 – 1 days (n = 788)			2 – 4 days (n = 736)		5 – 7 days (n = 390)		
Health Condition		No.	%	SR*	No.	%	SR	No.	%	SR	P
Common cold symptoms	No	401	(51)	1.47	334	(45)	-0.75	170	(44)	-1.06	0.03
	Yes	387	(49)	-1.39	402	(55)	0.71	220	(56)	1.00	
Dizziness	No	673	(85)	0.43	624	(85)	0.23	311	(80)	-0.92	0.03
	Yes	115	(15)	-0.98	112	(15)	-0.52	79	(20)	2.11	
Chills	No	689	(87)	0.76	624	(85)	-0.05	313	(80)	-1.01	0.01
	Yes	99	(13)	-1.80	112	(15)	0.12	77	(20)	2.39	
Cough	No	502	(64)	1.25	431	(59)	-0.59	220	(56)	-0.97	0.03
	Yes	286	(36)	-1.54	305	(41)	0.72	170	(44)	1.20	
Sore throat	No	527	(67)	1.10	461	(63)	-0.38	232	(59)	-1.05	0.03
	Yes	261	(33)	-1.46	275	(37)	0.50	158	(41)	1.40	
Fever	No	673	(85)	0.87	607	(82)	-0.04	301	(77)	-1.18	0.002
	Yes	115	(15)	-1.89	129	(18)	0.08	89	(23)	2.57	
Flu	No	726	(92)	0.50	666	(90)	0.01	339	(87)	-0.73	0.02
	Yes	62	(8)	-1.54	70	(10)	-0.04	51	(13)	2.25	
Diarrhea at least 3 days	No	726	(92)	0.50	672	(91)	0.25	333	(85)	-1.05	0.001
	Yes	62	(8)	-1.54	64	(9)	-0.76	57	(15)	3.23	
Stomach problems	No	635	(81)	0.60	584	(79)	0.20	287	(74)	-1.13	0.02
	Yes	153	(19)	-1.16	152	(21)	-0.39	103	(26)	2.18	

Table 4 Continued - Health condition by work-related aerobic activity

Health Condition		No. of days per week of work-related aerobic activity: 0 – 1 days (n = 788) No.	%	SR	2 – 4 days (n = 736) No.	%	SR	5 – 7 days (n = 390) No.	%	SR	P
Constipation	No	682	(87)	-0.37	657	(89)	0.43	341	(87)	-0.07	0.26
	Yes	106	(13)	0.98	79	(11)	-1.16	49	(13)	0.19	
Indigestion	No	652	(83)	0.14	618	(84)	0.50	305	(78)	-0.89	0.05
	Yes	136	(17)	-0.30	118	(16)	-1.08	85	(22)	1.92	
Nausea/vomiting	No	662	(84)	0.16	624	(85)	0.38	312	(80)	-0.75	0.11
	Yes	126	(16)	-0.36	112	(15)	-0.86	78	(20)	1.70	
Sinus trouble	No	541	(69)	0.74	484	(66)	-0.25	248	(64)	-0.71	0.19
	Yes	247	(31)	-1.04	252	(34)	0.35	142	(36)	1.00	
Hay fever	No	721	(91)	0.13	664	(90)	-0.24	358	(92)	0.15	0.58
	Yes	67	(9)	-0.41	72	(10)	0.77	32	(8)	-0.48	
Shortness of breath	No	721	(91)	0.88	648	(88)	-0.15	326	(84)	-1.04	<0.001
	Yes	67	(9)	-2.44	88	(12)	0.41	64	(16)	2.90	
Hoarseness	No	717	(91)	0.35	649	(88)	-0.47	353	(91)	0.15	0.17
	Yes	71	(9)	-1.04	87	(12)	1.39	37	(9)	-0.43	
Skin problems	No	644	(82)	0.22	584	(79)	-0.51	323	(83)	0.39	0.30
	Yes	144	(18)	-0.45	152	(21)	1.05	67	(17)	-0.81	
Muscle sprain or strain	No	659	(84)	0.96	586	(80)	-0.29	297	(76)	-0.97	0.01
	Yes	129	(16)	-1.95	150	(20)	0.58	93	(24)	1.98	
Back problems	No	594	(75)	0.70	544	(74)	0.21	264	(68)	-1.28	0.02
	Yes	194	(25)	-1.16	192	(26)	-0.35	126	(32)	2.12	
Hearing problems	No	715	(91)	0.26	663	(90)	0.06	342	(88)	-0.45	0.26
	Yes	73	(9)	-0.77	73	(10)	-0.19	48	(12)	1.35	

Table 4 Continued - Health condition by work-related aerobic activity

Health Condition		No. of days per week of work-related aerobic activity							
		0 – 1 days (n = 788)			2 – 4 days (n = 736)		5 – 7 days (n = 390)		
		No.	%	SR	No.	%	SR	No.	%	SR	P
Irritated eyes	No	628	(80)	0.12	581	(79)	-0.11	309	(79)	-0.02	0.94
	Yes	160	(20)	-0.24	155	(21)	0.22	81	(21)	0.03	
Trouble seeing	No	730	(93)	-0.01	684	(93)	0.07	360	(92)	-0.08	0 93
	Yes	58	(7)	0.05	52	(7)	-0.25	30	(8)	0.28	
Pain in stomach or abdomen	No	607	(77)	0.50	566	(77)	0.44	272	(70)	-1.31	0.01
	Yes	181	(23)	-0.87	170	(23)	-0.77	118	(30)	2.30	
Heat stress or heat stroke	No	764	(97)	-0.03	717	(97)	0.09	377	(97)	-0.08	0.75
	Yes	24	(3)	0.20	19	(3)	-0.55	13	(3)	0.47	
Headache	No	333	(42)	0.97	292	(40)	-0.17	142	(36)	-1.14	0.15
	Yes	455	(58)	-0.79	444	(60)	0.14	248	(64)	0.93	
Unable to perform duties because of a health condition	No	688	(87)	1.32	601	(82)	-0.41	300	(77)	-1.32	<0.001
	Yes	100	(13)	-2.92	135	(18)	0.90	90	(23)	2.92	

Note. Percentages are rounded up to the nearest whole number.

*SR = Standardized residuals.

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14. ABSTRACT (maximum 200 words)
Background. No recent studies on Navy personnel have examined the relationship between aerobic activity and adverse health conditions or medical care visits. This study examined these relationships to determine if aerobic activity was inversely related to self-reported health conditions and medical visits.
Methods. Contingency tables were computed for amount of self-reported aerobic activity and prevalence rate of adverse health conditions, number of adverse health conditions, number of medical visits, and gender. Chi-square and Fisher's exact tests were performed. Age, educational level, marital status, and gender were controlled for in some tests.
Results. Women exercised more frequently than men, and men engaged in more work-related aerobic activity days. Women also reported more health conditions, ($P < .001$), and more medical visits, ($P < .001$). Exercise was not related to number of reported health conditions overall, ($P = 0.12$), but frequent exercisers had a lower prevalence rate of specific adverse health conditions than infrequent exercisers. Those with frequent work-related aerobic activity had more overall health conditions than more sedentary workers, $P < .001$, and reported more specific adverse conditions. In contrast to the favorable association of exercise with reported health conditions, women who reported exercising frequently had more medical visits.
Conclusions. Moderate exercise is beneficial, but frequent work-related aerobic activity might have adverse health effects. According to self-reports, Navy men and women exercise more than their civilian counterparts, but some are still not meeting the minimum amounts recommended by the Navy.

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Medical visits, US Navy, exercise, health conditions, occurrence, US Navy, occupational health

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